ABSTRACT

Antibiotic resistance is a growing public health concern, and water treatment systems can contribute to its spread. This study investigated the development of biofouling and the emergence of antibiotic resistance in activated carbon and reverse osmosis filters. Both filter types experienced significant biofouling, characterized by the accumulation of microbial biomass and organic matter. Microbial growth and antibiotic resistance gene transfer were observed in both systems, influenced by factors such as treatment capacity and nutrient availability. Phosphorus concentration was found to play a significant role in promoting microbial growth and AR gene transfer, particularly under nutrient-limited conditions. Furthermore, the study examined the impact of emerging contaminants, such as per- and polyfluoroalkyl substances (PFAS), on filter performance and biofouling. While both AC and RO filters effectively removed PFAS, biofouling was observed, especially in the RO system. The presence of PFAS and other contaminants may contribute to the complexity of biofouling and antibiotic resistance dynamics in water treatment systems. Both short-term and long-term filtration experiments showed that fouling development and microbial growth may play an important role in the development of antibiotic resistance through horizontal gene transfer. Understanding the interplay between biofouling, antibiotic resistance, and emerging contaminants is crucial for optimizing water treatment processes and mitigating public health risks. Further research is needed to develop effective strategies for controlling biofouling and preventing the spread of antibiotic resistance in water treatment systems.